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Short communication

Erigeron acris L. subsp. *angulosus* (Gaudin) Vacc. (Asteraceae), a new taxon in the flora of Poland

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Abstract – The paper reports for the first time the occurrence of *Erigeron acris* subsp. *angulosus* in Poland. This rare European temperate plant was found in August 2014 in a former sand and gravel quarry, close to the Sobolewo reservoir in the town of Suwałki, north-eastern Poland. Species composition of the habitat is characterized by a phytosociological relevé based on the Braun-Blanquet method, diagnostic characters in comparison to the morphologically similar *E. acris* subsp. *droebachiensis* are presented using scanning electron microscopy imaging, and an identification key for *E. acris* s. l. in Poland is given.

Keywords: distribution, *Erigeron*, indumentum, Poland, scanning electron microscopy

Introduction

Erigeron acris L. subsp. *angulosus* (Gaudin) Vacc. (Asteraceae), a European temperate representative of *E. acris* L. s. l. (Greuter 2003, 2006–2016), is confined mainly to the alpine zone of the Alps (Šída 1998, 2000, 2004). It has been reported from France, Italy, Switzerland, Liechtenstein, Austria, Slovenia, Germany, the Czech Republic, Slovakia, Hungary, Romania and Estonia (Greuter 2006–2016). This biennial or perennial herb usually occurs in scree and gravel river bank plant communities of the class *Thlaspietea rotundifolii* (Mucina 1997). One of the most reliable diagnostic characters that allows *E. acris* subsp. *angulosus* to be distinguished from most of the other subspecies of *E. acris* is the absence of villous indumentum on stems, leaves, and involucral bracts, with the exception of the short-stipitate glandular trichomes on involucral bracts (Šída 1998).

In Poland, a recent study based on herbarium materials of *E. acris* s. l. deposited in the Polish herbaria (Pliszko 2015) revealed the occurrence of three subspecies, namely *E. acris* subsp. *acris*, *E. acris* subsp. *droebachiensis* (O. F. Müll.) Arcang., and *E. acris* subsp. *serotinus* (Weihe) Greuter. The present paper provides the first record of *E. acris* subsp. *angulosus* in Poland and is aimed at showing the morphological characteristics of the taxon as well as its distribution and habitat.

Materials and methods

Erigeron acris subsp. *angulosus* was identified based on morphological features given by Šída (1998, 2000, 2004) and its voucher specimens are deposited in the Herbarium of the Institute of Botany of the Jagiellonian University in Kraków (KRA). A phytosociological relevé followed the Braun-Blanquet method (Braun-Blanquet 1964). Names of syntaxa and diagnostic species followed Mucina (1997). Associated plants were identified after Wójciak (2003) and Rutkowski (2004). Names of taxa followed Mirek et al. (2002) and Ochyra et al. (2003). In morphometric and SEM studies *E. acris* subsp. *angulosus* was compared to the morphologically similar *E. acris* subsp. *droebachiensis*. Measurements were taken on herbarium specimens. Indumentum terminology followed Werker (2000). Specimens of *E. acris* subsp. *droebachiensis* used in the morphometric study were collected in Brzozowiec (south-eastern Poland) in July 2013 and 2014 (GPS coordinates: 49°25'54,36"N/22°11'57,36"E), whereas those used in the SEM study were collected in Toruń (north-central Poland) in July 2013 (GPS coordinates: 53°1'21,06"N/18°33'22,68"E). Samples of dry cauline leaves, peduncles, and capitula were mounted on aluminum stubs coated with double-sided conductive carbon tabs. Next, the samples were coated with gold in a sputter-coater and examined with a Hitachi S-4700 scanning electron microscope at

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an accelerating voltage of 10 kV, part of the standard procedure for viewing biological specimens in the SEM method (Bozzola and Russell 1999).

Results and discussion

Erigeron acris subsp. *angulosus* was discovered in August 2014 on the south-eastern outskirts of the town of Suwałki, north-eastern Poland (GPS coordinates: 54°4'18,06"N/22°57'48,84"E; altitude: 157 m.a.s.l.). According to Zając (1978), the locality is situated within the FB18 square unit of the ATPOL cartogram grid. A small population consisting of 25 individuals was found in a former sand and gravel quarry, close to the Sobolewo reservoir (Fig. 1). Vegetation in this anthropogenic habitat is represented by populations of grassland and ruderal plant species. The species composition in the site occupied by *E. acris* subsp. *angulosus* is characterized by the following phytosociological relevé: size of relevé: 25 m²; cover of herb layer: 20%; cover of moss layer: 40%; Ch.Cl. *Artemisietea vulgaris*: *Poa compressa* 2, *Melilotus albus* +; Ch.Cl. *Koelerio-Corynephoretea*: *Helichrysum arenarium* 1, *Arenaria serpyllifolia* +, *Herniaria glabra* +, *Ceratodon purpureus* (d) 3; Ch.Cl. *Festuco-Brometea*: *Artemisia campestris* 1, *Centaurea stoebe* +; others: *Erigeron acris* subsp. *angulosus* 1, *Hieracium pilosella* 1, *Oenothera* sp. 1, *Echium vulgare* +, *Erigeron acris* subsp. *acris* +, *Pinus sylvestris* +. Taking into consideration the selected quantitative features (Tab. 1), *E. acris* subsp. *angulosus* clearly shows shorter stems and synflorescences, and a lower number of capitula than *E. acris* subsp. *droebachiensis*. The number of cauline leaves is similar in both subspecies; however, the lower cauline leaves of *E. acris* subsp. *angulosus* are much narrower than those of *E. acris* subsp. *droebachiensis*. Regarding the SEM micrographs (On-line Suppl. Figs. 1–3), in contrast to *E. acris* subsp. *droebachiensis*, *E. acris* subsp. *angulosus* has no unbranched multicellular uniseriate non-glandular trichomes on involucral bracts, peduncles, and cauline leaves. On the other hand, the unbranched short-stipitate multicellular biseriate glandular trichomes are densely distributed on involucral bracts and sparsely on peduncles in both subspecies. Moreover, involucral bracts in *E. acris* subsp. *angulosus* are serrated relatively more deeply at the apex than those in *E. acris* subsp. *droebachiensis* (On-line Suppl. Fig. 2).

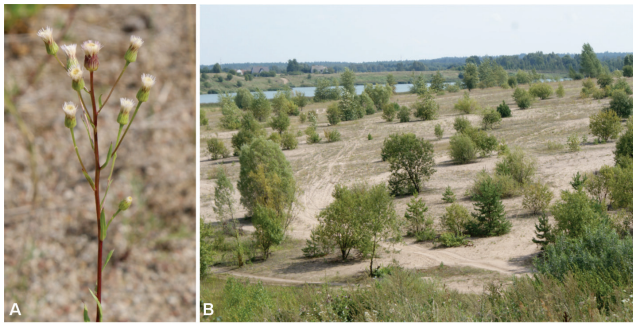

Fig. 1. *Erigeron acris* subsp. *angulosus* in Suwałki, north-eastern Poland: A – upper part of the plant; B – habitat (photos by A. Pliszko).

The occurrence of *E. acris* subsp. *angulosus* in north-eastern Poland suggests that there may be a continuity of its geographical distribution between Central Europe and the Baltic states, since the taxon is present in Estonia (Greuter 2006–2016). Furthermore, it is worth mentioning that most of the specimens collected in Suwałki have relatively more cauline leaves than those characterized by Šída (1998, 2000, 2004). This can be explained by the fact that they were found flowering in late summer. *Erigeron acris* subsp. *angulosus* typically flowers in June, and at higher altitudes in July (Šída 2000, 2004). For example, summer specimens of *E. acris* subsp. *acris* often produce more cauline leaves than typical late spring specimens, especially after mowing or grazing (Pliszko 2015). In this connection, it should also be mentioned that similar specimens with numerous glabrous cauline leaves and a low number of capitula were collected between Miedzierza and Sielpia Wielka (south-central Poland) by Walas in September 1929 (KRA 0124518). These specimens were mistakenly identified as *E. acris* subsp. *droebachiensis* (Pliszko 2015). However, it is hard to decide if they belong to *E. acris* subsp. *angulosus* because their atypical features seem to be a result of mowing or grazing. The locality between Miedzierza and Sielpia Wielka needs to be re-examined and the identity of the plant should be confirmed in the flowering stage in June or July.

E. acris subsp. *angulosus* is the rarest subspecies of *E. acris* in Poland. Although the habitat in which the plant was discovered shows an anthropogenic character, it should be viewed as a native taxon. Its presence was confirmed in July 2016 with one flowering specimen. The expansion of trees and shrubs during secondary succession and recreational use of motorcycles are the main factors that can pose a threat to the *E. acris* subsp. *angulosus* population in Suwałki.

Tab. 1. Morphological comparison of the selected quantitative characters of *Erigeron acris* subsp. *angulosus* and *E. acris* subsp. *droebachien*
N – number of examined individuals. Numbers indicate mean value (out of brackets), minimum and maximum values (in brackets).

Character	*Erigeron acris* subsp. *angulosus* (N=15)	*Erigeron acris* subsp. *droebachiensis* (N=15)
height of stem (cm)	31.9 (22.0–45.0)	46.6 (28.5–62)
number of cauline leaves	17.4 (12–24)	19.2 (10–25)
size of lower cauline leaf (cm)	3.8 × 0.4 (2.5–6.5 × 0.3–0.6)	7.6 × 1.0 (4.5–12.0 × 0.7–1.4)
number of capitula	6.2 (3–9)	21.3 (6–46)
lenght of synflorescence (cm)	6.6 (4.5–10.0)	14.1 (7–24)

Identification key for *Erigeron acris* s. l. in Poland

1. Stems and leaves densely villous, involucral bracts abaxially densely villous and sparsely short-stipitate glandular.....2

   Stems and leaves glabrous or sparsely villous at the base, involucral bracts abaxially densely short-stipitate glandular, glabrous or sparsely villous 3

2. Cauline leaves 4–16, flat, usually erect; internodes 1.0–8.0 cm; capitula in paniculiform synflorescence.....*Erigeron acris* subsp. *acris*

   Cauline leaves 12–36, broadly undulate, recurved; internodes 0.2–3.8 cm; capitula in racemiform or paniculiform synflorescence ..... *Erigeron acris* subsp. *serotinus*

3. Basal leaves with acute apex; cauline leaves narrowly lanceolate to linear; peduncles sparsely short-stipitate glandular or glabrous; capitula in racemiform synflorescence.....*Erigeron acris* subsp. *angulosus*

   Basal leaves with obtuse apex; cauline leaves lanceolate; peduncles densely to sparsely villous and short-stipitate glandular; capitula in paniculiform synflorescence.....*Erigeron acris* subsp. *droebachiensis*

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